

MITIGATION

- Methods of mitigation
- Design and installation
- Post-mitigation or confirmation testing
- Radon systems
- Community outreach

NOTE

Mitigation is an interim measure implemented until contaminated environmental media are remediated.

Today's training will focus on mitigation methods, not methods of remediating soil vapor, such as soil vapor extraction.

Mitigation objective

To minimize exposures associated with soil vapor intrusion



Methods of mitigation

Most effective mitigation methods involve

- sealing
- actively manipulating pressure differential between building's interior and exterior

Appropriate method depends on building design

- full basement or slab-on-grade
- crawlspace
- earthen floor
- multiple foundation types



Methods of mitigation

Basement slab or slab-on-grade foundation

- sub-slab depressurization system (SSD)
+ sealing
- if shown to be not practicable,
 - HVAC modification
 - SVE system
 - other

Methods of mitigation

Crawlspace foundation

- sub-membrane depressurization system (SMD) + sealing
- if shown to be not practicable,
 - HVAC modification
 - crawlspace ventilation + sealing
 - SVE system
 - other

Methods of mitigation

Basement with dirt floor

- new slab + SSD system — Preferred
- SMD system + vapor retarder

Multiple foundation types

- combination of the methods discussed

Undeveloped parcels

- will depend on development plans



Design and installation

Residential buildings

in accordance with EPA's

- *Radon Mitigation Standards*
- *Model Standards and Techniques for Control of Radon in New Residential Buildings*

Larger Buildings

- similar techniques with modifications
- technical guidance on EPA's radon website



Design and installation: Key considerations

- Designed to avoid creating other health, safety, or environmental hazards to occupants
- SSDs: communication test for design
- Locations of vent fan and discharge points
- System labeling
- Warning device (e.g., a manometer)

Post-mitigation or confirmation testing

All structures

- physical testing

Representative number of structures

- chemical testing

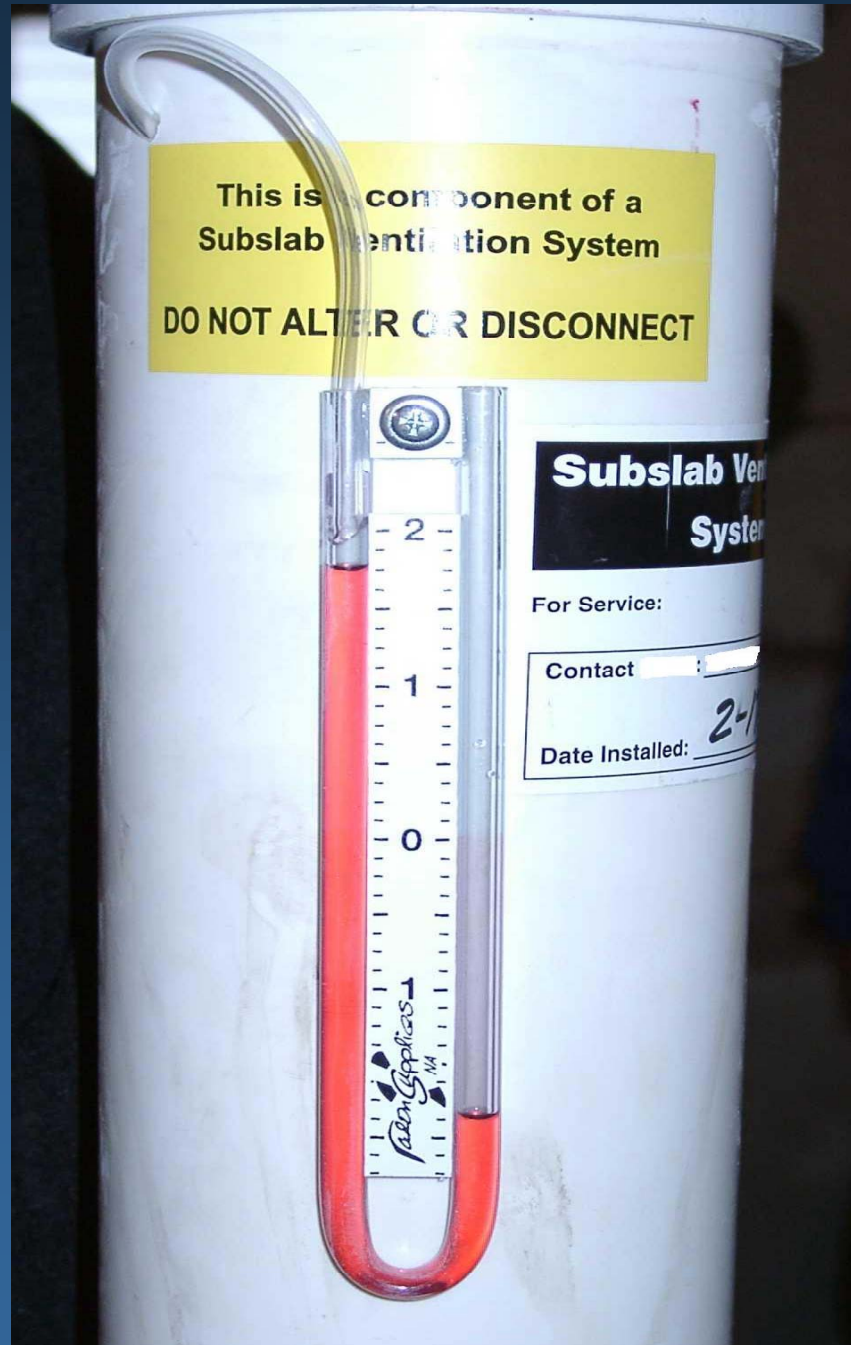
Example: Communication testing



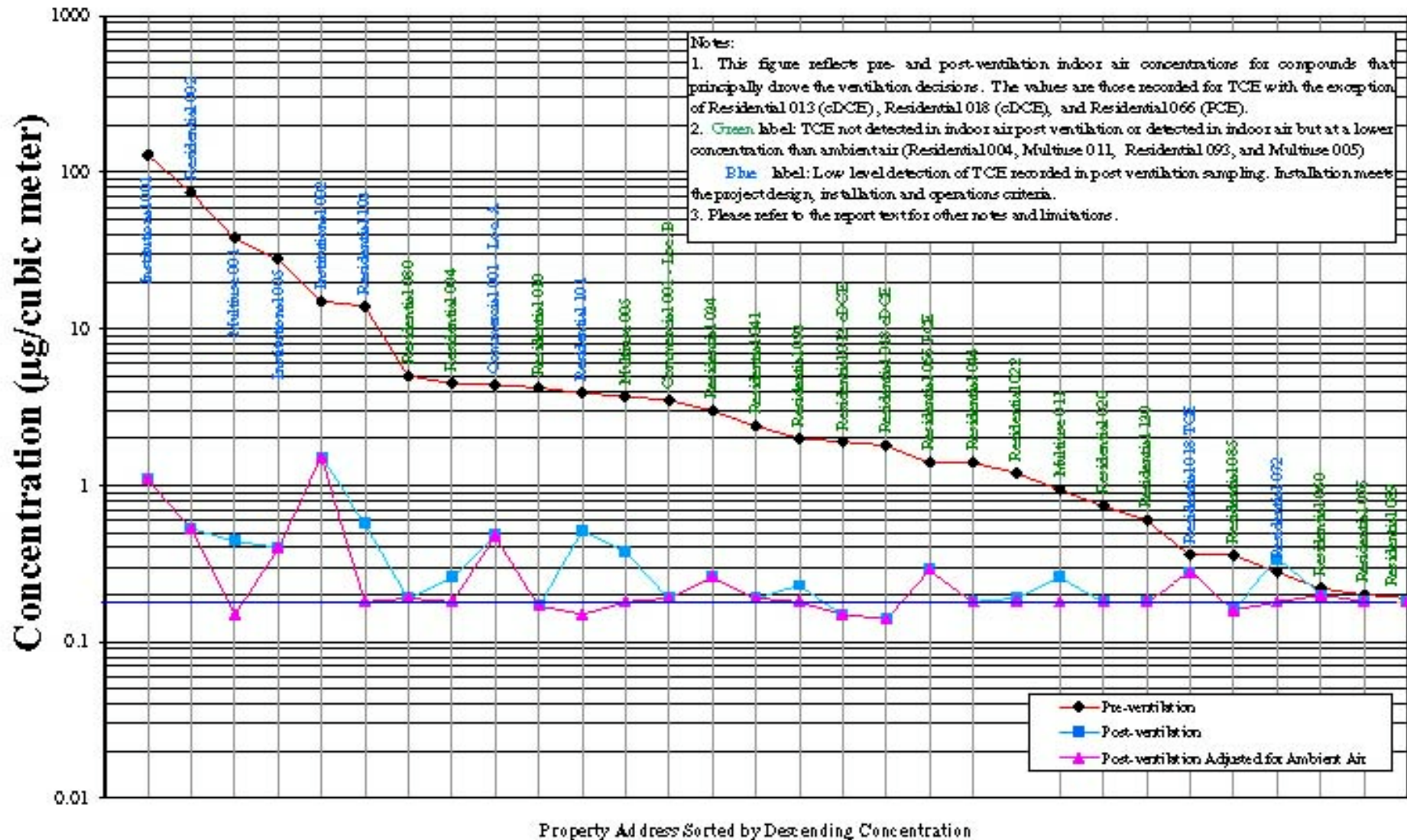
Example: Sealing communication test point



Example: Manometer and labeling



Summary of Pre- and Post-Ventilation Indoor Air Data



Radon systems already installed

If in an area of concern, then the system's effectiveness and proper installation should be confirmed

- procedures are consistent with those for SSD and SMD systems
- DO NOT assume the system is operating properly

Radon systems already installed

Who checks these systems?

Generally...

- if in an area where systems are being installed, then the party installing the systems would check
- if outside of the area of concern, then the property owner

Community outreach

Building owners and tenants should be informed on

- how the system works
- how they can check that it is operating properly
- who to contact if problems or concerns

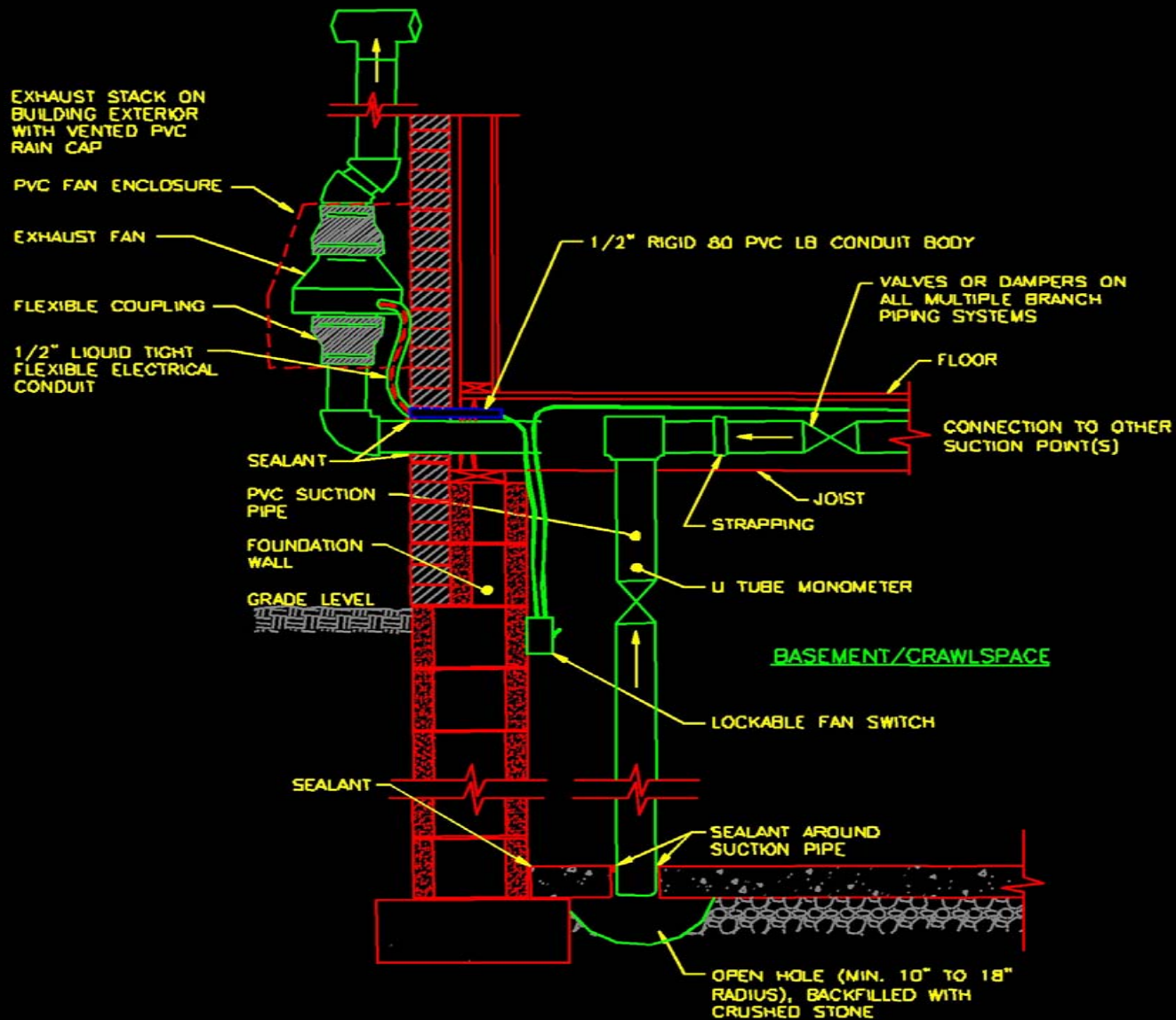
Fact sheet coming soon...

- sub-slab depressurization systems



Examples

Example: SSD system -- Basement



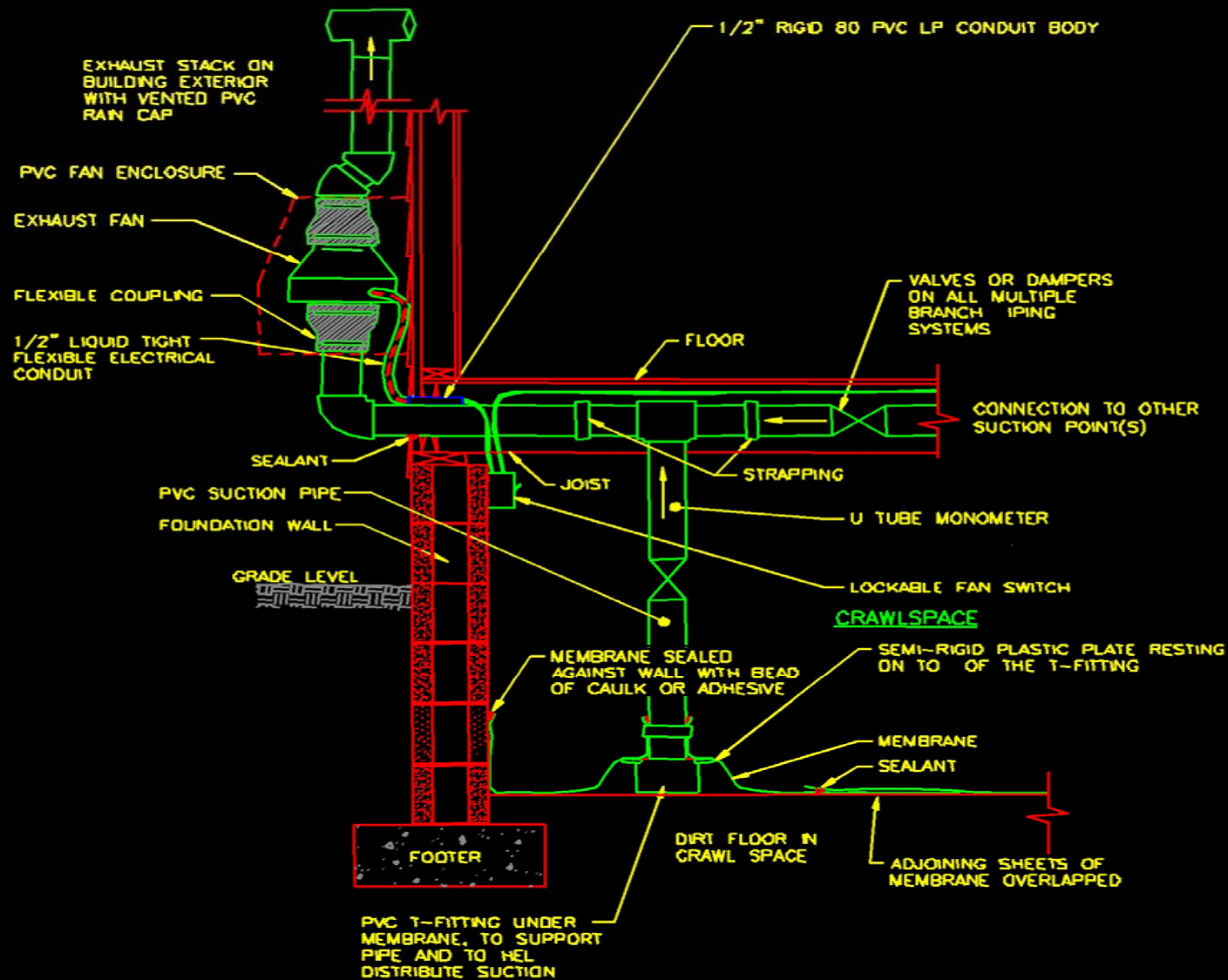
TYPICAL SECTION
NOT TO SCALE



Example: SSD system -- Basement



Example: SMD system -- Crawlspace



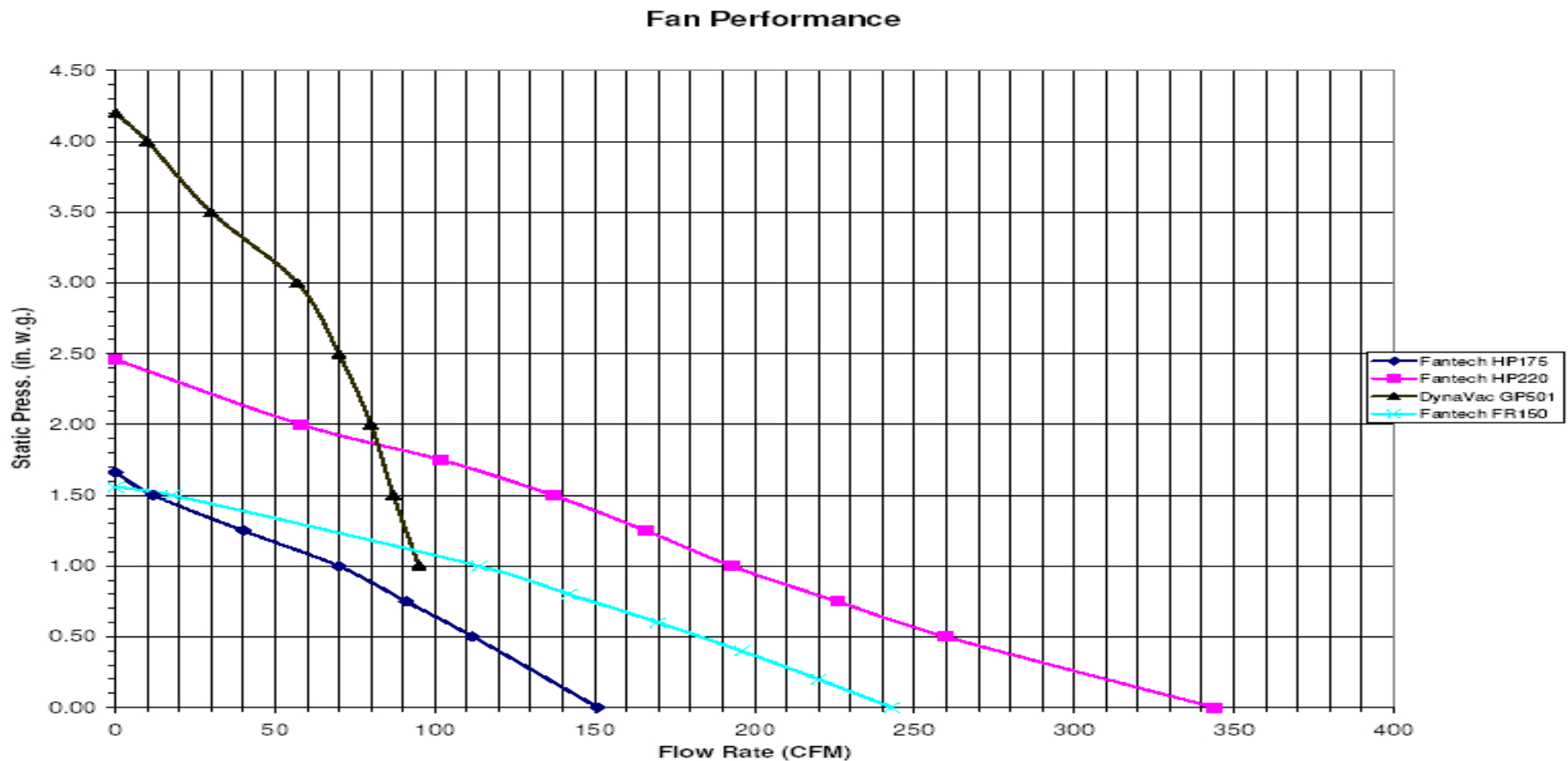
TYPICAL SECTION
NOT TO SCALE

Example: SMD system -- Crawlspace



Example: Detailed design

- Diagnostic communication testing
- Quantity and location of suction points
- Fan sizing and selection



Example: Visual inspection / Building survey

- Identification of features that allow vapor entry
 - stone foundation walls
 - open hollow block walls
 - dirt floors
 - crawlspaces
 - floor sumps and drains
 - major cracks in walls or floors
 - utility penetrations
- Chemical survey
- Backdraft test



Examples of design and construction issues

- Dirt floors
- Sumps or floor drains
- Slab and wall penetrations or cracks
- Accessible crawlspaces
- Inaccessible crawlspaces (heated and unheated)
- Layed-up stone walls
- Open-top foundation walls
- Condensation
- Basement clutter

Examples of design and construction issues

- Asbestos containing materials
 - transite siding
 - pipe insulation
 - floor tiles
 - floor tile or carpet mastic

Examples of design and construction issues

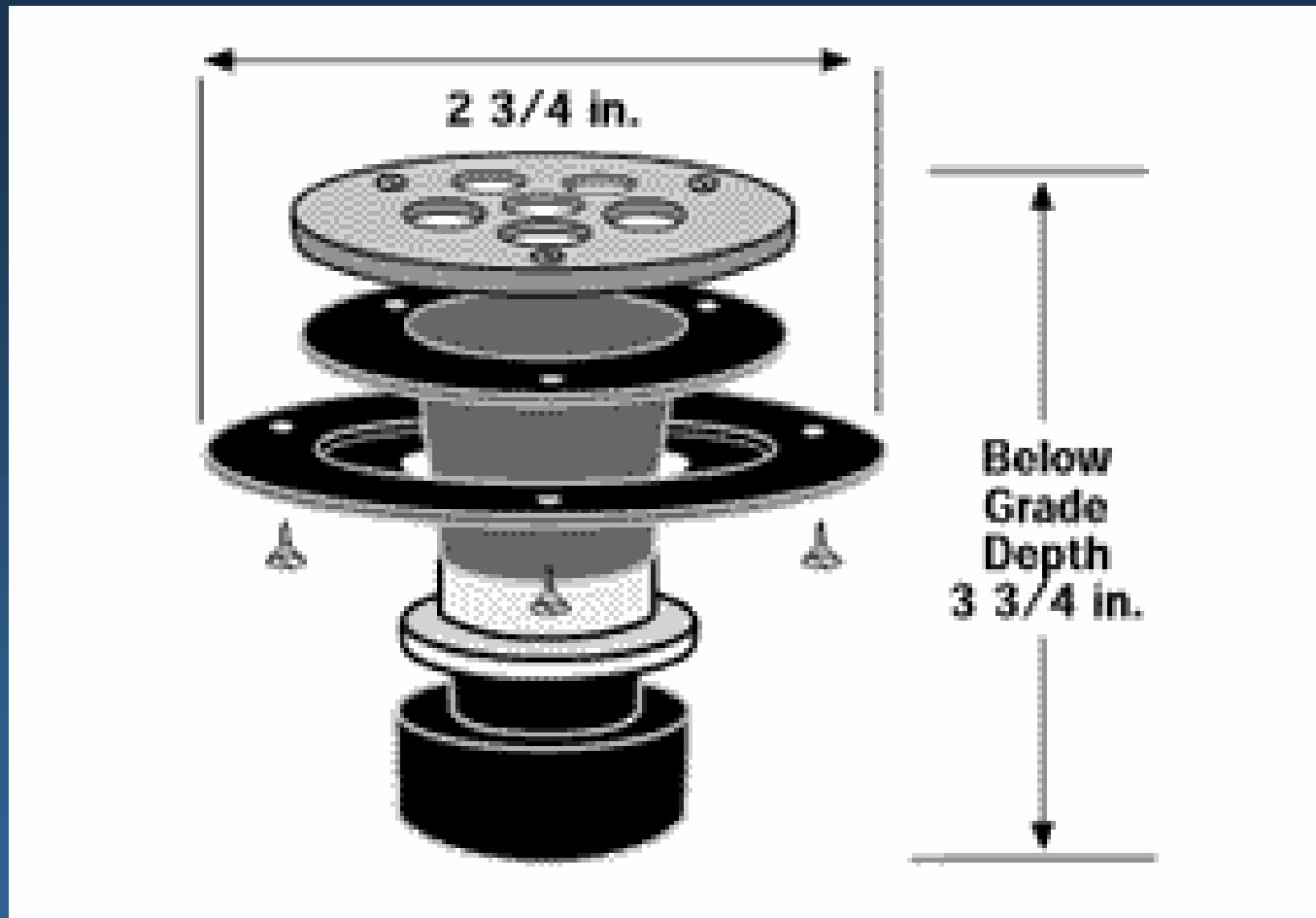
- Asbestos -- notification and air monitoring
 - Minor: < 10 sq ft / < 25 linear ft
No notification, no air monitoring
 - Small: 10 sq ft > area < 160 sq ft
25 linear ft > area < 260 linear ft
No notification, air monitoring before and after removal
 - Large: > 160 sq ft / > 260 linear ft
10 day prior notification, air monitoring before, during and after removal



Example: Sumps / Floor drains



Example: Typical floor drain



Example: Crawlspace heater & labeling



Example: Layed-up stone walls (before)



Example: Layed-up stone walls (after)



Example: Layed-up stone walls (after)



Example: Building pressurization

- Evaluate ex-filtration losses (including interior and exterior windows and doors) prior to HVAC system modifications
- Establish a positive pressure inside the building
- Install/modify HVAC fan system to increase air flow rate capacity
- Modify HVAC custom control to maintain design set point parameters based on pressure rather than temperature

Example: Building pressurization



Example: Building pressurization



Example: Building pressurization



Example: Building pressurization



Example: Building pressurization



Example: Special project (before)



Example: Special project (during)



Example: Special project (during)



Example: Special project (during)



Example: Special project (after)



Questions to address on existing radon systems

- Does the existing system depressurize the entire sub-slab area?
- Have all floor, wall, and floor/wall interface cracks/holes been sealed?
- Have crawlspaces been mitigated?
- Have stone walls been parged?
- Have open-top block walls been sealed?
- Have floor drains/sumps to dry wells been sealed?

Community relations

Pre-design communication with owners to familiarize them with systems; get written permission to access property

Scheduling issues for design and installation visits:

- unresponsive owners
- absentee owners; property access arrangements
- coordinate work activities to minimize disruption to commercial properties
- asbestos abatement notification postings

Community relations

Face-to-face discussions with owners to show and explain system

Provide fact sheets to owners describing systems and providing contacts for questions/problems

Place stickers/labels on system components with contact phone numbers